DAVID TAYLOR MODEL BASIN

INFORMATION BOOKLET

THE DAVID TAYLOR MODEL BASIN AND ITS ACTIVITIES

DAVID TAYLOR MODEL BASIN
Suburban Washington, D.C.

HIGH-SPEED DYNAMICS DIVISION
Hydromechanics Laboratory
Langley Field, Va.

UNDERWATER EXPLOSION RESEARCH DIVISION
Structural Mechanics Laboratory
Portsmouth, Va.

MOBILE ACOUSTIC BARGE
Acoustic and Vibration Laboratory
Charleston, S.C.

DAVID TAYLOR MODEL BASIN FIELD STATION
Lake Pend Oreille, Idaho

DAVID TAYLOR MODEL BASIN
WASHINGTON, D.C. 20007

Authorized by Act of Congress May 6, 1936
Dedicated November 4, 1939

THE TMB STORY

To ensure that our Navy's ships and aircraft have the best possible design features, the David Taylor Model Basin has unique facilities for exploring many areas of the engineering sciences and their interrelationships. But these would be only monuments in stone and steel without a highly skilled and dedicated staff to bring them to life in imaginative and fruitful programs of research and development.

The TMB story, then, is basically a story of our people, the problems they face and solve, and the specialized tools that help them to do so. This booklet has been prepared to acquaint you with the variety and scope of our efforts.

We are proud of TMB's past achievements, determined to deal effectively with the problems of today, and confident of our part in advancing naval science and technology for the future.

HISTORY

The David Taylor Model Basin and its predecessor, the Experimental Model Basin, have the longest history of continuous government service of any laboratory in the United States Navy. Located in the Potomac River Valley approximately 12 miles from downtown Washington, TMB is a living monument to the late Admiral David W. Taylor whose persistent efforts were largely responsible for EMB (1898), the country's first model basin, and its first large-scale wind tunnel (1916).

Rear Admiral David W. Taylor (CC) USN is probably best known for his "Standard Series," a classic in naval architecture, and for his pioneering in the scientific approach to aeronautics.

At the old Washington Navy Yard, EMB rose swiftly under Taylor's guidance to a position of leadership in naval architecture. With the advent of the air age, it gained additional fame for designing the hull of the Navy-Curtiss flying boat, the first aircraft in the world to effect a trans-Atlantic crossing. EMB was concerned with problems of vibration and structural strength as early as 1920, but it was not until 1932 that this section of the laboratory was formally organized.

As testing responsibilities increased in scope, space limitations at EMB became increasingly more acute. Finally, in May 1936, Congress authorized a laboratory building and shops for additional work in hydrodynamics and structural mechanics. Carderock, Maryland, was selected as the site because of the presence of the solid bedrock required as the foundation for test facilities and the abundant supply of fresh water needed for the large towing tanks. The then retired Admiral Taylor was present at the November 1939 dedication of the establishment which had been named in his honor.

Wind tunnel facilities were added in 1943 and the Aerodynamics Laboratory formally organized. Another major stride came 10 years later with the establishment of an Applied Mathematics Laboratory in 1953. In recognition of the intensified effort in underwater acoustics and related aspects of structural vibrations, a separate Acoustics and Vibration Laboratory became effective in January 1964.

The Carderock site of TMB covers approximately 186 acres. From an original investment of three and a half million dollars, TMB has grown into the largest research establishment of its kind in the world. Presently completed buildings, facilities, and equipment are now valued in excess of 64 million dollars. In this same period, the original staff of about 200 has increased to approximately 1700 civilian employees.

Several important components of TMB are geographically separated from the Carderock site. The Underwater Explosions Research Division of the Structural Mechanics Laboratory is located at Portsmouth, Virginia, and the High-Speed Dynamics Division of the Hydromechanics Laboratory is situated at Langley Field, Virginia.

The carriage of the original towing tank at EMB in the old Washington Navy Yard is shown in starting position. The design of over 1000 ships was influenced by R&D efforts at this pioneering installation.

The mobile noise-listening barge MONOB I, which plays a vital role in acoustic studies, operates out of Charleston, South Carolina, and the TMB Field Station for work in underwater countermeasures is located at Lake Pend Oreille, Idaho. The last of the active facilities at EMB went into honorable retirement in 1965.

IMPLEMENTING OUR MISSION

The Commanding Officer and Director is a naval officer designated for engineering duty and qualified in naval research and management. A civilian Technical Director is responsible to the Commanding Officer and Director for effective coordination and executive direction of the entire technical program. This program is carried out in five laboratories (Hydromechanics, Aerodynamics, Structural Mechanics, Applied Mathematics, and Acoustics and Vibration), each headed by an Associate Technical Director. The head of the Aerodynamics Laboratory is a naval officer designated for aeronautical engineering duty. The other laboratories are headed by civilian scientists with outstanding reputations in their respective fields.

Staff functions in direct support of the TMB program are consolidated in the staff of the Technical Director. The Program Division and the Plans and Analysis Division function under a Planning Director who is also responsible for centralized management of the technical programming and systems projects. Operation of the Central Instrumentation Division, which develops modern specialized instrumentation systems for the five laboratories, and the Technical Information Division, which provides library and exhibits services and the publication of TMB research results, is supervised by an Assistant for Technical Support. An Administrative Assistant and Technical Consultants report directly to the Technical Director.

Continuity of administration is provided by the Head of the Administrative Department, a career employee trained in administrative management. The other departments (Industrial, Supply, and Public Works) are headed by naval officers who are specialists in their respective areas.

HYDROMECHANICS - THE INTERACTIONS OF SHIPS WITH THE SEA

R&D PROGRAMS

Resistance and Powering

The Hydromechanics Laboratory conducts research, development, and testing on the resistance and powering characteristics of surface and submerged vessels and on the effectiveness of propulsion devices. This work includes lines-of-flow tests for proper location of bilge keels, struts, and other appendages; tests of prismatic planing surfaces to determine resistance, wetted area, and center of pressure; tests of hydrofoil configurations to estimate lift, drag, and side force; and basic research relating to frictional, wavemaking, and appendage resistance. Theoretical and experimental studies encompass the design, performance, and cavitation of propellors and propulsion devices and problems of steady and unsteady flow in the vicinity of ship hulls, propellors, and a combination of both. The laboratory coordinates the planning, installation, and operation of instrumentation on full-scale trials; analyzes the data obtained; and acts as consultant to Bureau of Ships, other Government agencies, and private concerns.

Stability and Control

Work in this area includes studies of the hydrodynamic forces and moments acting on submarines, surface ships, hydrofoil craft, planing craft, and torpedoes and their appendages. Procedures are developed for predicting these forces and moments and flow characteristics, tests of proposed designs of various vehicles are conducted, and programs are originated to improve instrumentation and testing methods. Also of interest is the development of towing arrangements for ships and torpedo countermeasures, special purpose surface and subsurface bodies and associated shipborne equipment, and criteria for maneuvering and handling characteristics.

Carriage 1 as shown operating over the deep-water basin. DTMB has organized national and international comparison tests to evaluate towing techniques of various model basins throughout the world.

A model of an auxiliary naval ship undergoes tests for pitching and heaving motions in the maneuvering-seakeeping basin of MASK.

Naval interest in hydrofoil craft has increased in recent years. These vessels pose special problems in that their operational characteristics differ in the "flying" (foilborne) and in the displacement (structureborne) conditions.

Our experts can determine what propeller arrangement will provide the greatest efficiency and the least vibration. The fashioning of model propellers is in itself a fine art at TMB, and a new method for casting has been developed which approximately halves manufacturing time without sacrificing precision.

Seaworthiness and Fluid Dynamics

Free-surface phenomena studies include basic theoretical studies of water waves, theoretical analyses of the excitation of rigid-body motions of ships at sea and the motion damping due to wave generation, and theoretical analyses of the waves and forces associated with a body moving on or near a free surface. Other work is related to a statistical description of motions of a ship in a confused sea and the factors affecting the seaworthiness of ships, to an analytical procedure for predicting ship motion and development of design criteria with respect to ship behavior in a seaway, and to the phenomena associated with motions in a seaway, e.g., slamming and wetness. Fluid dynamic problems include the application of potential flow methods to determine hydrodynamic pressures and velocity fields about shiplike bodies, struts, hydrofoils, and other ship appendages. The laboratory provides scientific and technical supervision of the contract portion of the BuShips General Hydromechanics Research Program and coordinates it with research conducted at TMB.

High-Speed Phenomena

Work in this area concerns high-speed craft and bodies such as hydrofoils, planing catamarans, hydroskis, supercavitating hydrofoils, and air-cushion vehicles. Evaluations are made of such factors as hydrodynamic forces and moments, porpoising in calm water, motions in waves, impact loading on landing, interference effects, effects of control devices, cavitation, ventilation, spray effects, and propulsion efficiency.

FACILITIES

The major facilities include four towing basins; one of these—the deep-water basin—is the largest of its kind in the world. Three towing carriages are equipped to tow models at normal test speeds and one can tow models in the high-speed basin at velocities up to 60 knots. Three variable-pressure water tunnels are used mainly for

A model of a POLARIS missile is fired underwater in the circulating water channel. Windows in the walls and bottom of the test section facilitate visual observations and photography.

testing propellers and other ship appendages, although some tests have been run on complete airplane models to determine flow phenomena at high velocities. A circulating water channel permits continuous observations from all sides and is particularly well suited for studying flow patterns around ships and for testing torpedo and missile shapes, mines, and other special underwater devices. The maneuvering-seakeeping basin is used to predict the full-scale performance of waterborne vehicles in realistic seas, and studies in the rotating arm basin provide detailed knowledge which contributes substantially to the various new vehicle concepts required in modern warfare. Other facilities include a SEADAC system for analyzing the spectrum of complex ocean waves, a motion simulator facility, plastic and glass-wall tanks for measuring the rate of rise of air bubbles in water, a low-turbulence wind tunnel for fundamental hydrodynamic research, a fluid phenomena laboratory, a miniature model basin, and a model circulating water channel. A salt water tank, designated Tank 1, is located at Langley Field, Virginia. TMB also has part-time use of Langley's high-speed (150-knot) hydrodynamics facility which is suitable for testing landing gear and hydrofoils at very high speeds.

This view of Tank 1 at Langley Field, Virginia, shows the control cab used for tests in following seas.

Twists in the rotating arm beam provide the basic hydrodynamic coefficients required to solve the complex problems associated with various new vehicle concepts needed in modern warfare.

Wavemakers in the maneuvering and seakeeping basin can produce regular, irregular long crested, and short crested seas. Thus maneuverability and control characteristics of vessels can be determined under truly realistic conditions.

This model of the Harold E. Saunders Maneuvering and Seakeeping Facilities (MASK) shows the rotating arm basin and the maneuvering-seakeeping basin. The building which houses these basins covers approximately 5 acres. The installation is named in honor of the late Captain Harold E. Saunders, USN, the only person who has served TMB both as Technical Director and (later) as Commanding Officer.

AERODYNAMICS - THE INTERACTIONS OF FLIGHT VEHICLES WITH THE AIR

R&D PROGRAMS

Subsonic Regime

The Aerodynamics Laboratory conducts basic and applied research in the area of incompressible flow to evaluate advanced concepts for air warfare systems and vehicles and to develop optimum performance, stability, and control characteristics. To lessen the dependence of military aircraft either on long runways or on elaborate launch and recovery devices, increased emphasis is placed on VTOL/STOL aircraft. The laboratory's problem in this area is to define a pattern of research and development that will provide optimum solutions to the conflicting design features of such aircraft and at a minimum of time and cost. Another important aspect of subsonic effort relates to the practical capabilities of air-cushion vehicles. TMB has provided international leadership in virtually all phases of ground effect machine (GEM) research and will continue to furnish sound bases for evaluating other interface vehicles. Also of major interest is the reduction of accident rates through a better understanding of the nature of the turbulent air wake of an aircraft carrier in the flight path of landing aircraft.

Transonic Regime

This research pertains to basic compressible flow phenomena, revolutionary aerodynamic concepts, and new theoretical and analytical approaches to basic aerodynamic problems. A rational approach to mutual interference is being sought in such areas as the captive flight/launch aerodynamics of aircraft stores. Studies are conducted on idealized situations which typify isolated aspects of the overall problem. New configurational combinations are studied to provide guidance in the preliminary design of future aircraft-weapon systems. Work in the area of dynamic

Aircraft-store separation is simulated in the 7- by 10-foot transonic wind tunnel to study problems of mutual interference between the weapon and the weapon carrier.

Personnel prepare a model of a guided missile for testing in the 18-inch channel of the supersonic wind tunnel.

A powered model of an open ocean V/STOL seaplane is readied for tests in the 8- by 10-foot wind tunnel to determine basic stability and control in cruise, transition, and hovering flight.

Stability of the full-scale operational Hydrus hydrodynamic SKMR-1 was improved as the result of model studies. Virtually every parameter, design, and application study which the Navy makes in this area is based on performance information from the GDM program at TMH.

stability emphasizes the development of improved experimental techniques for measuring important aerodynamic coefficients and improved analytical and empirical techniques for estimating them. The laboratory is also vitally concerned with the development and improvement of theories to correctly represent performance aspects of flow phenomena, particularly those involved in new and novel aircraft features. Increased accuracy and objectivity are essential to assist BuWeps to evaluate designs proposed by competing contractors.

Super/Hypersonic Regimes

The aerodynamic and heat transfer characteristics of aircraft missiles, components, and miscellaneous bodies are evaluated with particular reference to problems that develop at high speeds. Obviously it is not economically feasible for the Navy to develop even a substantial fraction of all the concepts proposed for super/hypersonic flight vehicles. A sound appraisal of key features is essential, therefore, to determine which of many multiple choices warrant exploration. The broad characteristics of realistically attainable vehicles must be examined within the framework of related sciences and alternate methods. Key technical obstacles of the most promising vehicles must then be defined and solved. Accordingly, ZMB pursues programs of basic and applied research in such areas as heat transfer, lift drag optimization, pressure recovery, and stability and control to achieve the competent background knowledge required to maintain a sound appraisal of the state of the art. The orientation is essentially aerodynamic although consideration is given to such interrelated elements as propulsion and structures/materials.

FACILITIES

The major facilities consist of subsonic, transonic, supersonic, and hypersonic wind tunnels. The two 8- by 10-ft subsonic tunnels are of the closed-circuit, single-return type and have a maximum airspeed of 180 mph.

A test stand with a 14-ft vertical test section is available for studying VTOL aircraft and helicopter rotor characteristics in the hovering attitude. The 7- by 10-ft transonic tunnel has a maximum speed of 900 mph; this tunnel and its 1/12-scale replica are equipped for the performance of all normal tests and for obtaining Schlieren photographs. The three indraft supersonic tunnels have a Mach number range from 0.1 to 4.5, and the blowdown-type hypersonic tunnel is capable of speeds from Mach 5 to 10. The spheres for the supersonic and hypersonic channels are interconnected for use in series to increase testing time. Each channel is provided with a Schlieren system for flow visualization, and the high-speed tunnels have readout systems which automatically prepare the data for analysis by high-speed computers. The Engineering Division designs models, equipment, and instruments of various types as required by the operating divisions and provides engineering computation and analysis, including the services of two ALWAC digital computers.

STRUCTURAL MECHANICS–THE STRENGTH OF SUBMARINES AND SURFACE SHIPS

R&D PROGRAMS

Submarine Structures

The Structural Mechanics Laboratory is recognized as the Navy's foremost authority on the behavior of structures subjected to external hydrostatic pressure. Many major theoretical contributions have helped explain disagreement between theory and early experimental work and have provided the naval architect with more effective design tools. As a complement to this fundamental research, models of new submarines are tested to verify static strength and fatigue life prior to construction; predictions are later evaluated during submerged trials of full-scale submarines. Another major program relates to design criteria for pressure hulls capable of operating at much deeper depths than presently possible. New fabrication techniques and novel new materials are being investigated. Also of vital interest are various types of end closures and the reinforcement of penetrations in the hull for torpedo tubes and missiles. In addition, TMB is responsible for correlating the work of other activities presently conducting research under the DoShips fatigue program.

Surface Ship Structures

The structural strength of major sections of the hulls of surface ships is evaluated in the design stage and later verified in full-scale ship trials. One broad area of research concerns the response of ship hull girders to the random loads experienced by the hull as the ship travels through rough seas. The response of individual components includes such factors as the effect of loads on the strength of plate-stiffener combinations, the effect of stress concentrations created by openings in the hull girder, the level of stress induced in the strut and submerged wings of hydrofoil craft when running at high speed, and the effect of slamming on the strength of the plates and framing. Consulting services are provided to the Navy Design Agency, the Maritime Commission, and other agencies.

Personnel measure frame deflection prone to installing strain gages on a submarine model. Techniques developed at TMB for waterproofing strain gages have been afforded national recognition.

A substantial breakthrough in construction and testing costs has been achieved by the successful use of extremely small-scale research models for deep-submergence work.

Underwater Explosions

Fundamental and applied research is conducted on underwater explosions and their effects on a variety of structures ranging from simple elements to operational ships and submarines. Both theoretical studies and explosive testing of full-size and reduced-scale targets are employed to understand more fully the complex phenomena involved. The Navy's most modern surface craft and submarines and the latest equipment installations are utilized in this work. Theoretical investigations of major concern include advanced research in such areas as structural vibrations, elastic transient deformations, theory of plasticity, incompressible and compressible hydrodynamics, and the theory of shock waves.

Mechanical Effects of Weapons

A recognized leader among Navy laboratories working in this area, TMB provides the Bureau of Ships, the Bureau of Naval Weapons, the Chief of Naval Operations, and the Defense Atomic Support Agency with information on weapon effects for planning ship protection, for weapon system studies, and for establishing operational doctrines. Research investigations include many experimental and theoretical problems in structural dynamics and the response of ship structures, equipment, and personnel to rapidly changing loads, including explosions in air and water. Model-scale laboratory studies are supplemented by full-scale tests at sea. Related theoretical studies help to develop a better understanding of the physical phenomena involved and to generalize the results obtained.

Full-scale shock tests have indicated the specific modifications required for adequate shock hardening and combat reliability of electronic systems aboard destroyers.

TMB staff members participate in a structural evaluation of a WIND-Class icebreaker 600 miles from the North Pole.

FACILITIES

A unique collection of pressure tanks is available for testing submarine models and underwater weapons, and a drop tower and a special impact tank are utilized in investigating the effect of impact on submarine model hulls. Three universal testing machines are available for testing structural models and material specimens. A pentagonal pond and two explosion pits are utilized for small-scale explosion tests in water and in air. In addition, there is a rapid load machine, a ballistic pendulum, a lightweight shock machine, a metallurgy laboratory, and a photoelasticity laboratory. The instrumented barge UNB-1, located at Portsmouth, Virginia, can be towed to sea for tests ranging from 1/3-scale side protection raissons and full-scale ship tests to deep-diving submarine model tests and investigations of underwater explosion phenomena. Two completely equipped instrument trailers are available for shipboard or field use in large-scale tests. Other facilities employed in conjunction with UEB-1 include a submersible submarine section and a floating shock platform which represents the double-bottom structure of a surface ship hull.

TMB has pressure tanks ranging in diameter from 20 inches to 12 feet. Here personnel prepare a large-scale submarine model for testing in the 12-foot-diameter pressure tank.

APPLIED MATHEMATICS—THEORY AND COMPUTERS APPLIED TO NAVAL DESIGN

R&D PROGRAMS

Naval Engineering Research

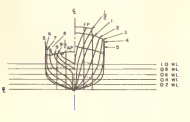
One broad area of the Applied Mathematics Laboratory's work is concerned with the development of mathematical models which lend themselves to the application of high-speed computer methods for solving problems in the design, construction, and maintenance of ships. For example, the behavior of a nuclear reactor has been described in terms of a complex system of partial differential equations. The ultimate goal is the efficient design of reactors without resorting to the operation of prototypes. In another instance, calculations of the forces acting on mooring lines have been applicable to a variety of engineering problems: the laying of submarine telegraph cables, the towing of a ship, and the snapping of telephone wires or power lines as a result of transient forces caused by storms. Other problems successfully handled by high-speed computer methods include calculations of the collapse pressures of submarine hulls, the vibration characteristics of ships and ship components, and reliable estimates of the effectiveness of minesweeping and other countermeasure operations under given conditions. The laboratory develops advanced programming systems and advises and assists Buships, its agencies, and other organizations in the definition and analysis of computational problems.

Management Data Analysis

The analysis of information which is of prime significance in management decisions is another area of major effort. One large logistics project which is carried out concerns the phased material requirements for the Navy's

The ultra-high-speed electronic computer system LASC can perform 250,000 operations per second. The development of an automatic programming system, SAL Logistics Assembly, has markedly reduced the time required for programming and checkout.

The proven practicability of utilizing high-speed computers to fair ship lines is expected to have far-reaching effects on the construction of ships. Preliminary lines of this oceanographic survey ship have been used to develop a means for fairing final ball lines.



shipbuilding programs. Several types of reports are produced by the computer: a mobilization report for a given building program, a summary report for each ship, an estimate for machinery, and material requirements for mobilization planning both in terms of specific components by weight and by units. The laboratory also develops automatic programming systems for many specific problems related to information storage and retrieval. For example, a system has been devised to handle the vast quantities of information accumulated on shock damage to and malfunctioning of equipment during underwater explosion tests. Designated Program STARSHINE, this system not only increases the efficiency of Fleet operations but also permits an evaluation of the effectiveness of the shock-hardening program itself.

Navy R&D Information

TMB develops, plans, and programs a Navy-wide research and development data system which provides top management in the Navy with the information necessary for managing and controlling its R&D programs. Research aimed at further improving and extending the system is conducted, and consultation services are furnished to the Office of Naval Research, the Chief of Naval Development, and the Project Coordinator for Navy-wide R&D Data Retrieval Systems.

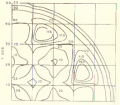
Computer Devices

Advanced research projects are part of a continuing effort to develop new computer devices or data-processing and translation systems and to improve existing systems. For instance, a small-scale digital computer system has been designed to control analog to digital conversion processing, and the computer data format translator has been modified to print out data recorded on magnetic tape. Design and installation have been completed on a modification to the Remington Rand Card-to-Tape Converter that enables it to accept and process 63 characters. This improvement reduces printing costs and eliminates the need for reediting IBM tapes.

FACILITIES

The principal computing system used to solve complex engineering and data-processing problems is the Sperry Rand LARC. This ultra-high-speed electronic computer is one of the most advanced systems of its type available in the Department of Defense. An IBM 7090 System is available for the solution of scientific and operations research problems and for problems of management data analysis. The laboratory also has a General Dynamics/Electronics Charactron Microfilm Printer-Plotter, a Computer Data Format Translator, and an Ampex Tape Transport. The combined capabilities of the major computers and the many auxiliary devices at the laboratory result in a universal data-processing system capable of performing almost any conceivable processing of a large variety of data.

One significant achievement has been the development of a computational method whereby the neutron distribution, and hence the temperature and power distribution, within the core of a nuclear reactor can be calculated and plotted automatically.



ACOUSTICS AND VIBRATION – SILENCING THE SHIPS

R&D PROGRAMS

Ship Acoustics

The Acoustics and Vibration Laboratory conducts acoustic trials to determine the radiated noise and the self-noise of submarines and surface ships and the effect of these acoustic characteristics on ship design and operation. Where remedial action is indicated, measures are recommended to control or eliminate the noise source on operating ships as well as on ships in the planning or design stages. Methods of acoustical measurements are investigated, acoustic ranging results are correlated, and noise-reduction measures are evaluated both for TMB programs and for outside activities.

Acoustic Research and Development

The major interest is in the interrelation of hydrodynamic excitation, structural response, and acoustic radiation. Of particular concern are the mechanisms of generation, transmission, and reduction of noise associated with fluid flow and with structural aspects of ships and auxiliary equipment. This laboratory collaborates with the Structural Mechanics Laboratory to investigate theories relating structural excitation to acoustic radiation, and, in conjunction with the Hydromechanics Laboratory, it determines hydrodynamic sources of sound and conducts research on dynamic structural aspects of the hydroelastic behavior of control surfaces and hydrofoils. Other studies include the noise of torpedoes and towed sonar, the structural impedance and target strength characteristics of models, and the development of silencing devices and countermeasures for full-scale applications.

Personnel prepare to install the main moorng system subsurface buoy for AUTEC.

AUTEC tracking baseline structure, vertical array cable (top) and signal transmission cable (bottom) are lowered into position.

Mechanical and Structural Vibrations

Vibration environments are investigated on all classes of naval ships to determine the vibration characteristics of ship hulls, machinery, and equipment and to develop methods to control or eliminate significant vibrations. Theoretical and experimental studies in applied mechanics are undertaken to increase understanding of the excitation of significant vibrations under various service loads as influenced by their coupling with the surrounding medium. Technical guidance in this area is furnished to BuShips and the Office of Naval Research to assist in evaluating research contracts.

Signal Processing

Data signal processing techniques are developed in collaboration with the Applied Mathematics Laboratory. The Acoustics and Vibration Laboratory has lead responsibility for developing the acoustic range of the Atlantic Undersea Test and Evaluation Center (AUTEC) now being established in the Bahama Islands. When completed, AUTEC will provide a highly automated, fixed acoustic ranging station for all types of surface and subsurface vessels.

FACILITIES

A mobile listening platform (MONOB I) is staffed and equipped to record all data necessary for an exhaustive study of the noise radiated from any ship and to produce a preliminary acoustic evaluation of each ship in the shortest time practicable. Redesigned by TMB from a YW-type water barge, MONOB I is a floating laboratory that can accommodate 44 scientific and engineering personnel in addition to her Navy crew. MONOB I is based at Charleston, South Carolina, and is suitable for prolonged tropic operation. MONOB instrumentation is compatible with that of the Acoustic Data Analysis Center (ADAC) at TMB to facilitate later and more detailed data processing. The laboratory

MONOB I is a complex of four laboratories which house the ship communications systems; the mess control, data acquisition, and monitoring instrumentation systems; the analog and digital computer systems; and the workspace and report writing spaces. These centrally-located facilities result in a quick identification of the major noise sources on submarines and surface vessels. MONOB is equipped for direct communication with the test vehicle and with TMB.

also has a variety of specialized equipment; for example, a calibrated noise source has been developed to produce a known amount of energy in water and allow a direct comparison of the noise radiated by a ship. For vibration studies, structures can be bolted to heavy rails anchored to bedrock, and a large baffle serves as a foundation for test apparatus. A unique collection of mechanical generators can produce known forces in structures ranging from small items of machinery to complete ships. These permit the study of mode shapes and the identification of critical localized vibration problems. A Vibration Data Analyzer (VIDA) and other highly specialized equipment are also available.

SUPPORT ACTIVITIES

The **Industrial Department** prepares and develops design specifications for the facilities and equipment used in research and testing. Areas of engineering specialization include structural, mechanical, electrical, and electro-mechanical. Metalworking, woodworking, and wax shops are available for the manufacture of instruments and models. The secretary involved in special test models of wood, wax, plastic, and metal requires mechanics of exceptional skill. The department also furnishes technical photography and a wide variety of reproduction processes.

The **Administrative Department** provides personnel, comptroller, management engineering, administrative and military services, fire prevention and protection, and security support to all areas of the Model Basin. The Department also administers the Bureau of Ships technical ship model programs.

The **Supply Department** furnishes a wide range of standard and special materials and operates retail store-rooms located adjacent to shops and major facilities. It arranges for shipment of equipment for field tests and full-scale trials and exercises centralized custody of all TMB instruments.

The **Public Works Department** provides all utilities and maintenance services to TMB. Additions and alterations to the station are planned, designed, and constructed by personnel of the department. Other services include transportation, rigging, and station development planning.

The **Office of Patent Counsel** advises on patents, inventions, and similar matters. It serves not only TMB but also the U.S. Marine Engineering Laboratory and all BuShips field activities in the Fifth Naval District and the Naval District of Washington, D.C.

The successful prosecution of our R&D programs depends in large measure on the blend of specialized talents and experience available in the Industrial Department.

The Woodworking Shop contains many unique items of equipment especially designed for producing the widely diversified hardware needed by the scientific and engineering staff.

STAFF DEVELOPMENT

The interchange of technical information through visits to other R&D activities, participation in conference and committee work, and attendance at meetings of national and international scientific societies serves as an effective means of staff development. In addition, TMB plays host to several scientific gatherings each year.

TMB also encourages the staff to take advantage of specialized training in order to keep abreast of the latest developments in their fields. During fiscal year 1963, for example, more than 30 percent of our 1700 employees received training of one type or another.

The most ambitious training program, designated the *integrated advanced training program*, provides for full or three-quarter time advanced academic study at a university of the employee's choice. Participants are selected on the basis of past academic record and work performance, their potential for professional growth as a result of this training, and its relevance to present or anticipated needs of TMB. Employees are on full salary during their studies, and TMB bears the cost of tuition and related expenses.

The *professional development program* provides employees up to 8 hours of government time a week to pursue undergraduate or advanced study in the physical sciences and engineering at American University, Catholic University, Georgetown University, George Washington University, Howard University, the University of Maryland, and other approved educational centers in the metropolitan area. If the demand for a particular course is sufficient, it is conducted at TMB by one of the local universities. Upon successful completion of course work, the employee is reimbursed for tuition and registration costs.

Other reimbursable professional training is available through *intensive short-term programs* (one to six weeks) at various universities, government agencies, and industrial organizations.

Cooperative education programs are currently in effect between TMB and Drexel Institute of Technology, Virginia Polytechnic Institute, Antioch College, University of Cincinnati, and Georgia Institute of Technology.

A co-op student checks out equipment before installation on the nuclear ship SAVANNAH.

Arrangements can also be made with other cooperative educational institutions that will accept engineering and physical science students on a work-study basis. This program enables students to alternate between college and work at TMB, to earn most of their college expenses, and to integrate work experience with academic training. In addition, the *avocation work program* offers college students the opportunity to gain subprofessional experience and become acquainted with TMB and its programs.

Management training programs are available to all levels of supervisory personnel. These are conducted periodically at TMB and other agencies and offer an excellent opportunity to develop managerial skills.

A *four-year apprentice training program* provides skilled craftsmen for the shops which support the R&D programs.

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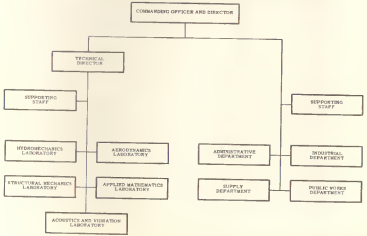
Inquirion regarding employment should be addressed to:

Personnel Officer
David Taylor Model Basin
Washington, D.C. 20007

David Taylor Model Basin Organization Chart



David Taylor Model Basin

Washington, D.C. and Suburban Area